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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|------------------------------|------------------------|
| 10/572,957 | 03/21/2006 | Toshiaki Kakinami | Q92639 | 4788 |
| 23373 7590 12/04/2008 SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037 | | | EXAMINER DRENNAN, BARRY T | |
| | | | ART UNIT 4133 | PAPER NUMBER |
| | | | MAIL DATE 12/04/2008 | DELIVERY MODE PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/572,957

Applicant(s)

KAKINAMI ET AL.

Examiner

Barry Drennan

Art Unit

4133

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 March 2006.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-13 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 21 March 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-850)
Paper No(s)/Mail Date 3/21/2006, 5/30/2006, 4/9/2007
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Inventor's Patent Application
6) ☐ Other: _____

DETAILED ACTION

Priority

1. This application claims benefit as a national stage application of PCT/JP04/13803, filed under the Patent Cooperation Treaty on 22 September 2004. This application also claims foreign priority from JP 2003-331357, filed in Japan on 24 September 2003.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: "Device for finding the location of a road traveling lane in an image by comparison to detected block-shaped repeated pavement markings".

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

1. Claims 1-13 are rejected under 35 U.S.C. 101 because the claimed invention is drawn to non-statutory subject matter. The claims appear to define an apparatus using means-plus-function language (invoking 35 U.S.C. 112, sixth paragraph) for each limitation, but the written description describes the corresponding structure as a

"section," with no further indication of the embodying structure provided. The claims thus encompass embodiments where each limitation is implemented as pure software. Therefore, the claims as a whole appear to be nothing more than a collection of software elements, thus describing functional descriptive material *per se*. Claims drawn to functional descriptive material *per se* have been held nonstatutory (In re Warmerdam, 31 USPQ2d 1760).

Examiner notes that even if 35 U.S.C. 112, sixth paragraph, were not being invoked, these claims would still be rejected on the same grounds because they would still encompass embodiments implemented as pure software.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Each of claims 1-13 recites means-plus-function limitations invoking 35 U.S.C. 112, sixth paragraph. Each of these limitations is distinctly linked to a structural element given in the written description, specifically a "section," with no further indication of what the structure of each section *is*, even though there is subsequent ample recitation of what each section *does*. This constitutes insufficient disclosure of corresponding

structure commensurate with the requirements of 35 U.S.C. 112, sixth paragraph, thus rendering each claim indefinite under 35 U.S.C. 112, second paragraph.

4. Claims 10-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 10 recites the limitation "said vehicle" on page 28. There is insufficient antecedent basis for this limitation in the claim. Claims 11-13 are dependent upon claim 10, and are therefore rejected for the same reason.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 4, 5, 6, 8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Otsuka et al., U.S. Patent Application Publication 2003/0103650 A1 (published 5 June 2003, hereinafter Otsuka), and further in view of Saka et al., U.S. Patent 6,590,521 B1 (issued 8 July 2003, hereinafter Saka).

7. With respect to claim 1, Otsuka discloses:
detecting edge points in a contour of an image (paragraph 38);

producing a histogram for the edge points (paragraph 44);
determining the presence or absence of markings on the basis of periodicity and a combination of distribution of edges in the histogram (paragraph 44, and Fig. 5B, implicit in detecting shorter peaks for block-like markings rather than solid lines);
detecting vertical edge points outside of the center of a lane where the block-like marking line is present (paragraph 45); and
defining the lane boundary as a curve fitted to those points (paragraph 46).
Otsuka does not disclose using a vertical edge histogram to determine the boundaries of the block-like markings.

However, Saka discloses using a vertical edge histogram (Fig. 13 #151, "horizontal edge histogram"), which finds the top and bottom boundaries of an object (Fig. 13, #155). (Note that Saka reverses the labels "horizontal" and "vertical" for the histograms as compared to the present application.)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the road marking detection apparatus of Otsuka with the histogram-based object boundary detection technique of Saka, motivated by the need to detect lane boundaries regardless of the type of marking used (Otsuka, paragraph 13).

8. With respect to claim 4, Otsuka further discloses applying a plurality of straight lines (Fig. 6 #61, #62) to achieve a curve-fitting (paragraph 46).

9. With respect to claim 5, Otsuka further discloses using Hough conversion to achieve a curve-fitting (paragraph 46).

10. With respect to claim 6, Otsuka discloses:

detecting edge points in a contour of an image (paragraph 38);

producing a histogram for the edge points (paragraph 44);

determining the presence or absence of markings on the basis of periodicity and a combination of distribution of edges in the histogram (paragraph 44, and Fig. 5B, implicit in detecting shorter peaks for block-like markings rather than solid lines);

detecting vertical edge points outside of the center of a lane where the block-like marking line is present (paragraph 45); and

defining the lane boundary as a curve fitted to those points (paragraph 46).

Otsuka does not disclose using a horizontal edge histogram to determine the boundaries of the block-like markings.

However, Saka discloses using a horizontal edge histogram (Fig. 13 #153, "vertical edge histogram"), which finds the left and right boundaries of an object (Fig. 13, #157). (Note that Saka reverses the labels "horizontal" and "vertical" for the histograms as compared to the present application.)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the road marking detection apparatus of Otsuka with the histogram-based object boundary detection technique of Saka,

motivated by the need to detect lane boundaries regardless of the type of marking used (Otsuka, paragraph 13).

11. With respect to claim 8, Otsuka further discloses applying a plurality of straight lines (Fig. 6 #61, #62) to achieve a curve-fitting (paragraph 46).

12. With respect to claim 9, Otsuka further discloses using Hough conversion to achieve a curve-fitting (paragraph 46).

13. Claims 2 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Otsuka and Saka as applied to claims 1 and 6 above, respectively, and further in view of Kakinami et al., U.S. Patent 5,991,427 (issued 23 November 1999, hereinafter Kakinami).

14. With respect to claim 2, Otsuka and Saka disclose the limitations of parent claim 1, but do not disclose making a reverse projection of the coordinate data into three dimensions.

However, Kakinami discloses reverse projecting detected edge points into 3-d space (Fig. 5, #102, #104, and #105).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the road edge detection apparatus of Otsuka and Saka with the coordinate transformation of Kakinami, motivated by the simplified calculations (parallel road lines converge toward a distant point of convergence in

projected space, but are truly parallel in 3-d space) and additional potential uses (reconstruction of 3-d scenes with the collected data) once the edge points are transformed back into 3-d space.

15. With respect to claim 7, Otsuka and Saka disclose the limitations of parent claim 6, but do not disclose making a reverse projection of the coordinate data into three dimensions.

However, Kakinami discloses reverse projecting detected edge points into 3-d space (Fig. 5, #102, #104, and #105).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the road edge detection apparatus of Otsuka and Saka with the coordinate transformation of Kakinami, motivated by the simplified calculations (parallel road lines converge toward a distant point of convergence in projected space, but are truly parallel in 3-d space) and additional potential uses (reconstruction of 3-d scenes with the collected data) once the edge points are transformed back into 3-d space.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ohta, A., U.S. Patent Application Publication 2002/0159616.

Nakayama et al., U.S. Patent 5,359,666.

Kakinami et al., U.S. Patent 6,172,600.

Kakinami et al., U.S. Patent 6,205,234.

Sasaki et al., U.S. Patent 6,445,809.

Oike et al., U.S. Patent 6,449,383.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Barry Drennan whose telephone number is 571-270-7262. The examiner can normally be reached on Monday through Thursday and alternate Fridays from 8:30am to 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Abul Azad can be reached on 571-272-7599. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Barry Drennan/
Examiner, Art Unit 4133

/ABUL AZAD/
Supervisory Patent Examiner, Art
Unit 4133

